

Standards of practice in Paediatric Cardiac Catheterisation - Position Statement

**These guidelines were originally developed and have been revised by
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Paediatric and Congenital Council.**

**The guidelines were reviewed by the Quality Standards Committee and
ratified at the CSANZ Board meeting held on 6 November, 2020.**

Background

The investigation and treatment of congenital and acquired paediatric cardiac conditions has continued to evolve over time. Whilst diagnostic techniques have long been employed in these conditions there is an increasing role and reliance on interventional procedures in ongoing management. The ability to perform these procedures safely and effectively requires specific training which often differs from adult cardiac procedures. In addition, there is the need for specialized equipment, trained catheterisation laboratory staff and ancillary paediatric support services to facilitate an optimal environment for these procedures.

These guidelines have been developed and refined following review of the published data and in consultation with the directors of all major paediatric cardiac catheterisation laboratories in Australia and New Zealand. The guidelines are informed by international standards with consideration of local geographical, resource and clinical factors. They apply to infants and children under the age of 16 years and may also be useful when undertaking cardiac catheterisation in older teenagers with congenital heart disease.

Types of Procedures:

Paediatric cardiac catheterisation is classified predominantly in to diagnostic and interventional procedures, both of which carry a procedural risk. Systems of attempting to predict and score relative risk have been developed and continue to evolve, focusing both on patient factors (pre-dominantly age related) and procedure type. The data presented in tabular form below has been derived by an assessment of these procedures in the North American IMPACT registry and offers a guide when considering procedural risk.

Recommendations

1. **Location:** Paediatric cardiac catheterisation should only be undertaken in centres which have appropriate cardiac catheterisation laboratories and personnel for the paediatric age group. These centres should have access to paediatric intensive care and paediatric anaesthesia. The exception for this is balloon atrial septostomy which can be undertaken in neonatal intensive care units with echocardiographic guidance. Whilst on-site paediatric cardiac surgical and perfusion services are not essential for Category 1 and 2 complexity cases, they ideally should be available for Category 3 interventional cases and are essential for Category 4 cases. For Category 3 noninterventional cases (i.e. diagnostic catheterisation in infants <1 month of age), on-site paediatric surgical and perfusion services should be available at the discretion of the director of the cardiac catheterisation laboratory.
2. **Credentialing & Supervision:** The performance of cardiac catheterisation is a necessary component of basic and advanced training in Paediatric Cardiology. Training should be undertaken in paediatric cardiac centres that perform at least 150 cases per year and have at least one experienced interventional cardiologist. The trainee must participate in a minimum of 100 cases with at least 50 of these as the predominant primary operator of Category 1 or 2 complexity. Ideally all trainees should have experience with other levels of paediatric cardiac catheterisation.

It is preferable that specialised training in interventional catheterisation be completed before paediatric cardiologists are credentialed for Category 2, 3 and 4 procedures. However the credentialing for all procedures regardless of complexity needs to be assessed individually by the director of the catheterisation laboratory in each institution. It is the ideal that Category 2 interventional procedures would be performed under supervision of a specialist paediatric interventional cardiologist, whilst Category 3 and 4 interventional procedures would be best performed by a specialist paediatric interventional cardiologist.

The paediatric cardiac catheterisation laboratory should perform a minimum of 60 cases a year to maintain proficiency.

3. **Audit:** All centres undertaking paediatric cardiac catheterisation should perform a regular audit of procedures, including outcome and the occurrence of any adverse events. All cases should be presented at regular institutional meetings and be open to peer review.
4. **Maintenance of Competence:** To maintain competency in Category 1 paediatric cardiac catheterisations, a cardiologist should perform at least 25 cases per year or be approved for practice by the director of the cardiac catheterisation laboratory based on his or her assessment of competency. Exceptions are bedside balloon atrial septostomy in the newborn with echocardiographic guidance and pericardiocentesis, which may be performed by a cardiologist experienced in this procedure who does not perform other cardiac catheterisation procedures, subject to the approval of the Head of the Department. These procedures should be audited as outlined in recommendation 3. Competency in more complex procedures (Category 2, 3 & 4) should be assessed by the director of the cardiac catheterisation laboratory taking into consideration results of departmental audits and the experience of the operator.

Invasive electrophysiological studies performed by paediatric cardiologists, including catheter ablation therapy for arrhythmias in children, involve cardiac catheterisation and transeptal atrial needle puncture. Therefore, these procedures can be accepted as accreditation for competency of Level 1 paediatric cardiac catheterisation and transeptal atrial puncture. However, this document is not intended to cover paediatric electrophysiological training or accreditation.

References

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Table 1. Procedure Type Risk Categories

	Risk Category 1	Risk Category 2	Risk Category 3	Risk Category 4
Diagnostic case	Age ≥1 yr	Age ≥1 month <1 yr	Age <1 month	
Valvuloplasty		Pulmonary valve ≥1 month	Aortic valve ≥1 month Pulmonary valve <1 month Tricuspid valve	Mitral valve Aortic valve <1 month
Device or coil closure	Venous collateral LSVC	PDA ASD or PFO Fontan fenestration Systemic to pulmonary artery collaterals	Systemic surgical shunt Baffle leak Coronary fistula	VSD Perivalvular leak
Balloon angioplasty		RVOT Aorta dilation <8 atm	Pulmonary artery <4 vessels Pulmonary artery ≥4 vessels all <8 atm Aorta >8 atm or CB Systemic artery (not aorta) Systemic surgical shunt Systemic to pulmonary collaterals Systemic vein	Pulmonary artery ≥4 vessels Pulmonary vein
Stent placement		Systemic vein	RVOT Aorta Systemic artery (not aorta)	Ventricular septum Pulmonary artery Pulmonary vein Systemic surgical shunt Systemic pulmonary collateral

Stent redilation		RVOT Atrial septum Aorta Systemic artery (not aorta) Systemic vein	Pulmonary artery Pulmonary vein	Ventricular septum
Other	Atrial septostomy in the newborn Myocardial biopsy	Snare foreign body Trans-septal puncture	Recanalization of jailed vessel in stent Recanalization of occluded vessel	Atrial septum dilation and stent Any catheterization <4 days after surgery Atretic valve perforation

ASD = atrial septal defect; CB = cutting balloon; LSVC = left superior vena cava; PDA = patent ductus arteriosus; PFO = patent foramen ovale; RVOT = right ventricular outflow tract (RVOT includes right ventricle to pulmonary artery conduit or status post-RVOT surgery with no conduit); VSD = ventricular septal defect.

Adapted from: Bergersen L et al. Catheterisation for congenital heart disease adjustment for risk method. JACC: Cardiovascular interventions; 2011; vol 4 no 9; 1037-46 – Figure 1.